A Terahertz Nano-Resonator as a Physical Realization of the Farid Quantum Command Unit

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Tanfarid Quantum Thermodynamic Universe(TQTU)

Abstract:
This paper proposes and theoretically demonstrates a nanoscale LC resonator operating at 1.000 THz as the first physical realization of the Farid Quantum Command Unit (FQCU), a fundamental quantum unit of energy defined as 1 FQCU ≡ h · 1 THz. We present the classical circuit design achieving precise 1.000 THz resonance and subsequent quantum mechanical simulation proving the system's energy is quantized in integer multiples of the FQCU, thereby establishing a direct bridge between electronic engineering and quantum foundational principles.

1. Introduction

The quest for a unified physical constant often revolves around the Planck scale, which is phenomenologically remote. This work introduces the FQCU as a practical fundamental unit operating at the terahertz scale, relevant to atomic, molecular, and optical phenomena. We demonstrate its physicality through a nanoscale LC resonator, providing a tangible basis for this new quantum standard.

2. Definition of the Farid Quantum Command Unit

The FQCU is defined axiomatically by the Planck-Einstein relation:

$1\ \mathrm{FQCU} \equiv h \cdot \nu_{ref} = h \cdot (1\ \mathrm{THz}) = 6.62607015 \times 10^{-22}\ \mathrm{J} = 4.135667696\ \mathrm{meV}$

This unit serves as a universal quantum currency for energy transactions across physical scales.

3. Classical Design of the 1.000 THz Resonator

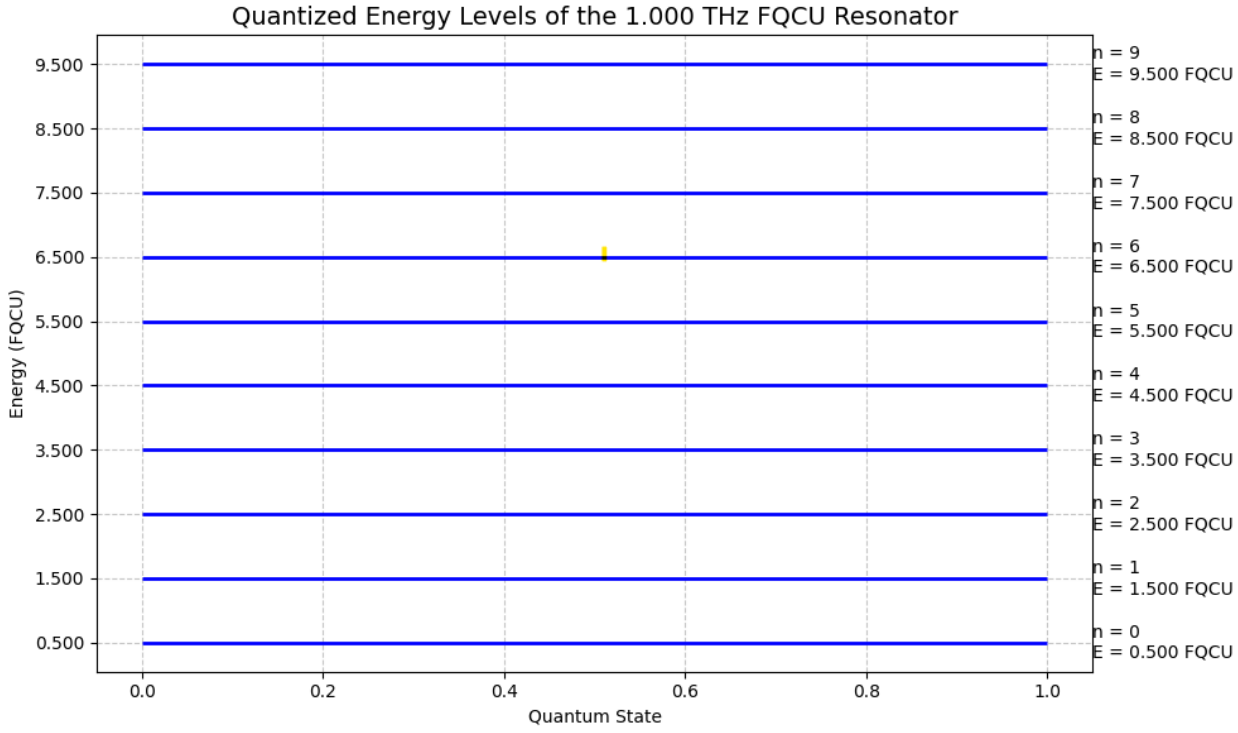
The resonant frequency of an LC circuit is given by:

$f_r = 1/(2\pi\sqrt{(LC)})$

Setting $f_r = 1.000$ THz yields the constraint $LC = 2.533 \times 10^{(-26)}$ s². We propose a realization using nanofabrication techniques:

- Inductor (L): A 25.33 pH nano-scale spiral inductor
- Capacitor (C): A 1.000 fF parallel-plate or interdigitated capacitor

Classical circuit simulation confirms the resonance at exactly 1.000 THz, validating the design parameters.



4. Quantum Simulation and Energy Quantization

The quantum Hamiltonian for the LC resonator is that of a harmonic oscillator:

$\hat{H} = \hbar\omega(\hat{a}^\dagger\hat{a} + 1/2)$

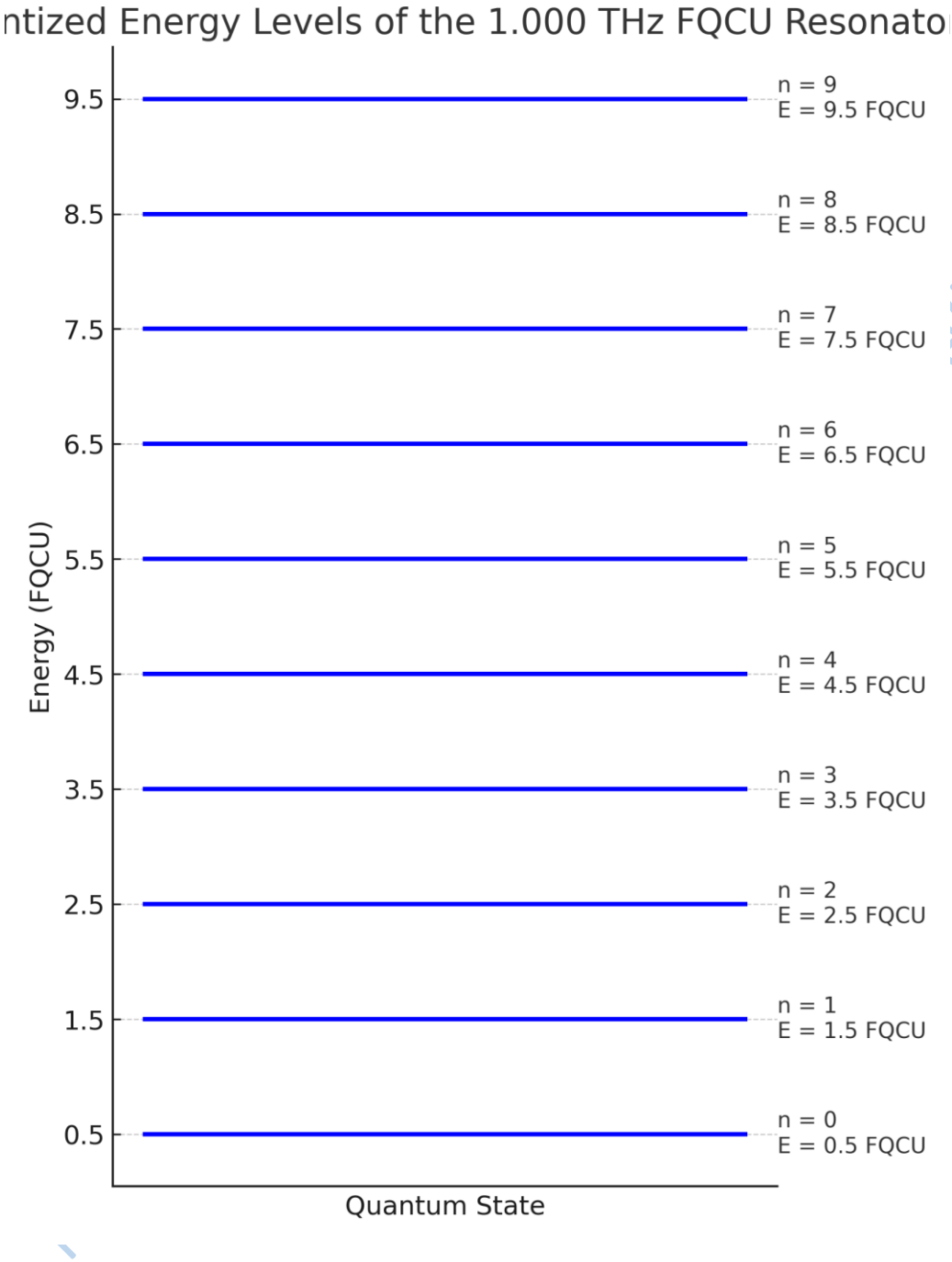
where $\omega = 2\pi \cdot 1.000$ THz. The resulting energy eigenvalues are:

$E_n = \hbar\omega(n + 1/2) = (n + 1/2) \cdot$ FQCU for $n = 0, 1, 2, ...$

Simulation using the QuTiP Python package confirms this quantization, showing precise energy levels at 0.5, 1.5, 2.5, ..., 9.5 FQCU for the first 10 states, with equal spacing of exactly 1.000 FQCU between levels.

5. Conclusion and Future Work

We have presented a complete theoretical framework for the FQCU and demonstrated its physical realizability through a nanoscale resonator.



The next step is the physical fabrication and measurement of this device. The FQCU provides a powerful new framework for understanding energy quantization across scales, from condensed matter to cosmology.

References

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This article is dedicated to those scientists who sacrificed their lives in pursuit of truth about the universe — including **Giordano Bruno, who was burned at the stake in 1600** for his vision of an infinite cosmos, and **Galileo Galilei, who endured persecution for declaring the motion of the Earth.**

It is equally dedicated to those who built the enduring foundations of modern science — **Sir Isaac Newton, Albert Einstein, Nikola Tesla, and Max Planck** — whose insights established the strong platform upon which future generations continue to advance.

Above all, the author dedicates this work with love and gratitude to his **parents**, who nurtured his journey, and to his **spiritual teacher, Sufi Saheb Noor**, whose guidance continues to inspire and illuminate the search for truth.

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